CLAIMS

1. A lossless processor for integer-valued signals comprising a prediction filter, wherein the prediction filter includes a quantiser where, at each sample instant, an input to the quantiser is jointly responsive to:

(a) a first sample value of a signal input to the prediction filter;

(b) a second sample value of a signal input to the prediction filter at a previous sample instant; and

(c) an output value of the quantiser at a previous sample instant.

2. A lossless processor according to claim 1 further comprising a first sub-filter and a second sub-filter, each sub-filter having a delay of at least one sample, wherein the second sample value is the input of the first sub-filter and the input to the quantiser is responsive to the output value of the quantiser via the second sub-filter.

3. A lossless processor according to claim 2 in which the first and second sub-filters are substantially linear.

4. A lossless processor according to claim 2 in which at least one of the first and second sub-filters comprises at least one recursive filter.

5. A lossless processor according to claim 2 in which each of the first and second sub-filters are finite impulse response (FIR) filters.

6. A lossless processor according to claim 5 in which each of the first and second sub-filters have finite precision coefficients.

7. A lossless processor according to claim 1, wherein said processor comprises a cascaded series of prediction filters, wherein at least one of said prediction filters is said prediction filter.

8. A lossless processor according to claim 7 further comprising a quantiser which follows the cascaded series of prediction filters, wherein the quantiser is provided with a

quantization step which is a multiple of the quantization steps of the quantisers within the cascaded series of prediction filters.

9. A lossless processor according to claim 1 in which the prediction filter further comprises a noise shaper for affecting the output of the quantiser.

10. A lossless processor according to claim 1 further comprising an invertible first transformation for processing an input signal to the quantiser of the prediction filter and an invertible second transformation for processing an output of the quantiser of the prediction filter.

11. A lossless processor according to claim 10 in which at least one of the first and second invertible transformations is an encoding quantiser.

12. A lossless processor according to claim 10 in which at least one of the first and second invertible transformations is a matrix quantiser.

13. A lossless processor according to claim 1, wherein said lossless processor is a lossless encoder which gives a lossless prediction encoded signal output.

14. A lossless processor according to claim 1, wherein said lossless processor is a lossless decoder for decoding a prediction encoded signal.

15. A lossless processor according to claim 1, wherein said lossless processor is a lossless shelf-filter.

16. A lossless processor according to claim 1, wherein said lossless processor is a lossless pre-emphasiser.

17. A system for transmitting or storage of integer-value signals in one or more channels, said system comprising:

(a) a lossless encoder providing a prediction encoded signal, wherein said lossless encoder comprises a first lossless processor for integer-valued signals,

said first lossless processor comprising a first prediction filter that includes a first quantiser where, at each sample instant, an input to the first quantiser is jointly responsive to:

(1) a first sample value of a signal input to the first prediction filter;

(2) a second sample value of a signal input to the first prediction filter at a previous sample instant; and

(3) an output value of the first quantiser at a previous sample instant; and

(b) a lossless decoder that inverts a transformation performed by the lossless encoder, wherein the lossless decoder comprises a second lossless processor for integer-valued signals, said second lossless processor comprising a second prediction filter that includes a second quantiser where, at each sample instant, an input to the second quantiser is jointly responsive to:

(1) a first sample value of a signal input to the second prediction filter;

(2) a second sample value of a signal input to the second prediction filter at a previous sample instant; and

(3) an output value of the second quantiser at a previous sample instant.

18. A method of lossless processing of an integer-valued signal in a prediction filter comprising a quantiser, wherein the prediction filter has a transfer function in which a numerator is implemented prior to the quantiser and a denominator is implemented recursively around the quantiser.

19. A lossless processor according to claim 1 in which the input to the quantiser is fed in dependence on the output of an autodither generator, wherein said autodither generator output is responsive to at least one of:

(a) an output of the lossless processor at previous sampling instants;

(b) an output of the quantiser at previous sampling instants;

(c) an input of the lossless processor at previous sampling instants; and

(d) an input of the quantiser at previous sampling instants.

20. A lossless processor according to claim 19 in which the autodither generator is fed from previous values of the output of the lossless processor.

21. A lossless processor according to claim 19 in which the autodither generator is fed from previous values of the input of the lossless processor.

22. A lossless processor according to claim 19 configured as a de-emphasiser.

23. A lossless processor according to claim 1 configured as a de-emphasiser.

24. A lossless processor according to claim 1 in which the processor is adapted to process an input signal in the form of image waveform data defined on arrays of sampling instants in two or more dimensions.

25. A signal processor in a decoder for lossless gain control comprising an input terminal, an output terminal and a signal processing path coupled between the input terminal and the output terminal, wherein the signal processing path comprises:

an autodither generator having an output;

a linear combining circuit having an output, having a first input coupled to the input terminal, and having a second input coupled to the output of the autodither generator, wherein the output of the linear combining circuit provides a signal representing a linear combination of signals received at the first and second inputs of the linear combining circuit; and

a quantiser having an input coupled to an output of the multiplier, and having an output coupled to the output terminal.

26. An encoding system in which a lossless encoder is preceded by a rounding quantiser that quantises an input signal to a reduced quantising precision such that a first data rate resulting from lossless encoding of the reduced quantising-precision signal is less than a second data rate that would result from lossless encoding of the input signal.

27. An encoding system according to claim 26 in which said rounding quantiser incorporates noise-shaping such that its quantisation error is less audible than a corresponding quantisation error without noise-shaping.

28. An encoding system according to claim 26 in which the rounding quantiser is adaptive and its rounding precision is adapted so that a transmitted data rate does not exceed a predetermined rate.

29. An encoding system according to claim 26 in which the rounding quantiser is adaptive and its rounding precision is adapted to control a signal-to-noise ratio of the reduced quantising-precision signal according to a psychoacoustic criterion.

30. An encoding system according to claim 26 in which the rounding quantiser is adaptive and its precision is adapted so that its output is the same as its input for signals for which said second data rate does not exceed a predetermined rate.

31. An encoding system according to claim 26 in which the rounding quantiser adds a DC offset that is adjusted in response to the reduced rounding precision to minimise a difference between the input signal and the output signal of the adaptive rounding quantiser.

32. An encoding system according to claim 26 in which the rounding quantiser dithers the input to the quantiser in dependence on the output of the rounding quantiser at previous sampling instants.

33. An encoding system according to claim 26 in which the rounding quantiser incorporates noise-shaping that is responsive to an auditory masking curve.